Dublin San Ramon Services District

Consolidated Water Use Efficiency 2002

Proposition 13 - Urban Water Conservation Program

Lost Water Recovery Program

Grant Proposal

March 1, 2002

Dublin San Ramon Services District
Lost Water Recovery Program

Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:
A. Project Information Form

1. Applying for (select one):

☒ (a) Prop 13 Urban Water Conservation Capital Outlay Grant

☐ (b) Prop 13 Agricultural Water Conservation Capital Outlay Feasibility Study Grant

☐ (c) DWR Water Use Efficiency Project

2. Principal applicant (Organization or affiliation): Dublin San Ramon Services District

3. Project Title: Lost Water Recovery Program

4. Person authorized to sign and submit proposal:

Name, title	Bert Michalczyk, Gen. Mgr.
Mailing address	7051 Dublin Blvd., Dublin CA 94568
Telephone	(925) 551-7230 x 106
Fax.	(925) 829-1180
E-mail	michalcz@dsrsd.com

5. Contact person (if different):

Name, title.	Stan Kolodzie, Asst. Eng.
Mailing address.	Same as above
Telephone	(925) 551-7230 x 107
Fax.	(925) 829-1180
E-mail	kolodzie@dsrsd.com

6. Funds requested (dollar amount): $1,350,000

7. Applicant funds pledged (dollar amount):

8. Total project costs (dollar amount): **$1,350,000**

9. Estimated total quantifiable project benefits (dollar amount): $1,592,000

Percentage of benefit to be accrued by applicant: **100%**

Percentage of benefit to be accrued by CALFED or others:

Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:
A. Project Information Form (continued)

10. Estimated annual amount of water to be saved (acre-feet): **1032 AF/yr**

Estimated total amount of water to be saved (acre-feet): **10,320 AF**

Over _10__ years **10 yrs**

Estimated benefits to be realized in terms of water quality, instream flow, other:

11. Duration of project (month/year to month/year): 1/2002 to 12/2004

12. State Assembly District where the project is to be conducted: Assembly District 15

13. State Senate District where the project is to be conducted: Senate District 7

14. Congressional district(s) where the project is to be conducted: District 10

15. County where the project is to be conducted: Alameda County

16. Date most recent Urban Water Management Plan submitted to the Department of Water Resources: May 2000

17. Type of applicant (select one):
Prop 13 Urban Grants and Prop 13 Agricultural Feasibility Study Grants:

- ☐ (a) city
- ☐ (b) county
- ☐ (c) city and county
- ☐ (d) joint power authority
- ☒ (e) other political subdivision of the State, including public water district
- ☐ (f) incorporated mutual water company

DWR WUE Projects: the above entities (a) through (f) or:

- ☐ (g) investor-owned utility
- ☐ (h) non-profit organization
- ☐ (i) tribe
- ☐ (j) university
- ☐ (k) state agency
- ☐ (l) federal agency

18. Project focus:

- ☐ (a) agricultural
- ☒ (b) urban

Proposal Part One:
A. Project Information Form (continued)

19. Project type (select one):
Prop 13 Urban Grant or Prop 13 Agricultural Feasibility Study Grant capital outlay project related to:

- ☒ (a) implementation of Urban Best Management Practices
- ☐ (b) implementation of Agricultural Efficient Water Management Practices
- ☐ (c) implementation of Quantifiable Objectives (include QO number(s)

  _____
- ☐ (d) other (specify)

  _____

DWR WUE Project related to:

- ☐ (e) implementation of Urban Best Management Practices
- ☐ (f) implementation of Agricultural Efficient Water Management Practices
- ☐ (g) implementation of Quantifiable Objectives (include QO number(s))
- ☐ (h) innovative projects (initial investigation of new technologies, methodologies, approaches, or institutional frameworks)
- ☐ (i) research or pilot projects
- ☐ (j) education or public information programs
- ☐ (k) other (specify)

  _____

20. Do the actions in this proposal involve physical changes in land use, or potential future changes in land use?

- ☐ (a) yes
- ☒ (b) no

If yes, the applicant must complete the CALFED PSP Land Use Checklist found at http://calfed.water.ca.gov/environmental_docs.html and submit it with the proposal.

Consolidated Water Use Efficiency 2002 PSP
Proposal Part One
B. Signature Page

By signing below, the official declares the following:

The truthfulness of all representations in the proposal;

The individual signing the form is authorized to submit the proposal on behalf of the applicant; and

The individual signing the form read and understood the conflict of interest and confidentiality section and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant.

_____	_Bert Michalczyk, Gen. Mgr.	_____
Signature	Name and title	Date

Dublin San Ramon Services District
Lost Water Recovery Program

Summary

Dublin San Ramon Services District is implementing a Lost Water Recovery Program to improve the overall Water Conservation program and the efficiency of its water distribution and accounting systems. The goal of the program is to reduce Unaccounted Water and thereby better manage the water resources available to the agency. The District is dedicated to reducing its average annual potable water losses from a high of 18% to the aggressive target of 4% of water production. In this effort, the District is using the developing AWWA "International Water Audit Method" to correctly label the areas of lost water, new technology to locate water leaks and old fashioned elbow-grease to correct the identified problems.

The Lost Water Recovery Program has two time periods(phases) of focus. The first is "Immediately", which realistically translates to 2002. In this first time period the District plans to correct Apparent or "Paper" Losses associated with its meters and customer billing system. The second phase is a three-year period in which the District will find, quantify and repair Real Losses(i.e. leaks in its distribution system). Both phases of the total effort have capital projects approved and underway to improve the District's Water Use Efficiency.

Currently, the District has begun two projects to correct inaccuracies/deficiencies in meter readings: 1) a project to determine those commercial meters (1-inch or larger) that are not sized correctly or need corrections to their installations to insure accurate readings and 2) a general plan for residential meters to replace all meters older than 15 years. (Due to funding limitations the District has not replaced all the aging meters for the past 8 to 10 years.)

Over the three year time period, the District intends to focus on Real Water Losses. In this part of the program, the District will install meters at the pump stations at the nodes of the District Pressure Zones. These meters will be on the 8" to 14" trunk mains. The meters and Data Loggers will identify the total leak loss in each District pressure zone from late-night flows one pressure zone at a time, and the Leak Detection Correlators will locate the leaks for quick repair.

The District estimates that up to 18% of its Source Water has been lost in previous years through all causes of Unaccounted Water. Some years, this has amounted to $800,000 in lost revenue and 1100 AF of water. The District program has estimated spending $1,350,000 over three years. Achieving the District goal of no more than 4% Lost Water from all causes will save the District $750,000 and 1032 AF of water(Real and Apparent) per year. The costs of the Lost Water Recovery Program will thus pay out in two years. The increase in revenue will be used to maintain lower water rates for the customers. A benefit to California and the region will be the reduction in water demand of 563 AF/yr. on water supply infrastructure.

A. Scope of Work: Relevance and Importance

1. Nature, Scope, Objectives: The nature of DSRSD's Lost Water Recovery Program is an investment of capital and effort by the District to improve the entire, already established, potable water distribution system within the District. The challenge before the District, spelled out in our Mission Statement, is to provide safe and sufficient water supplies to its customers while using the best available Water Conservation practices. This program upgrades both the way the District analyzes its Water Use Efficiency and the material assets in its system.

The scope of the program includes both material and human assets. Financial capital is being invested in the tangible assets of individual account meters, zone meters on trunk lines and construction costs. All parts of the distribution system from the pump stations in the pressure zones to the meters at the end of the individual water services will be examined for needed repairs or improvements.

Man-hours are also being invested in the education of the District's engineering and customer service personnel to learn and adopt the terminology and Best Practice Methodology for Water Loss Management that is becoming more uniform across the country. This methodology was originally developed by the International Water Association [1]. As the demand on the finite water supply resource in the United States grows, the methodology is increasingly being recognized as a best management practice and adopted for use by water providers across this country[2].

The objectives of the DSRSD program are to: 1) replace the single family home meters whose age indicates a loss in accuracy, 2) determine the level of accuracy in the commercial meters in the District, 3) replace the improperly sized commercial meters with an appropriate size, 4) correct deficiencies in the installation of the commercial meters which create inaccuracies in meter reading and 5) institute a regular, cyclical program of leak detection and repair of the water distribution system focused on the District's pressure zones.

2. Critical Issues: The most critical local and regional water issue is providing sufficient water supply for the growth in population that is occurring in the local area. The East Bay community of California is seeing sustained population growth which has brought new demands for water service in the past several years and will continue to put new demands on water supplies. Increasing the efficiency of the current water used in the District will reduce pressure to find additional water supplies to the same extent as the volume of Real Lost Water is recovered. Also, to the extent that accurate measure of actual water usage is given to our customers (addressing Paper Losses), the motivation for Water conservation is increased.

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[1] Alegre, H., Hirner, W., Baptista, J. and Parena, R.: *Performance Indicators for Water Supply Services.* IWA Publishing 'Manual of Best Practice' Series 2000. ISBN 1 900222 272

[2] Kunkel, G.: *Water Loss Recovery - Our Greatest Untapped Water Resource?* AWWA - 2002 Water Sources Conference Proceedings

A second critical issue comes into play on a state and federal level. As pointed out in the previous reference, past efforts in Water Use Efficiency have been hindered by a lack of consistent terminology and methodology across the state and the United States. With this program, the District will join with other water providers across the country using the same terminology and the same analysis techniques. This common method will facilitate the exchange of ideas and best practices between water providers thereby improving Water Use Efficiency on a broad scale.

B. Scope of Work: Technical/Scientific Merit, Feasibility, Monitoring and Assessment

1. In 2001, the District commissioned a water audit that disclosed a significant loss of water from the District's supply to the customers. The water audit found that only 84.2% of the source water for year 2000 was recorded in the billing records of the District. In previous years, this percentage was as low as 82%. This program is in response to the substantial loss of the water resource and the revenue also lost with the water.

The breakdown of the water losses from the Water Audit are:

Source water:	100.0%
Accounted for water	84.2%
Meter inaccuracies due to age	5.3%
Inaccurate meter factors and registries	0.8%
Authorized non-account water	1.1%
Unauthorized diversion at construction	1.1%
Unknown system leaks	7.6%

Meter Inaccuracies

Residential meters A literature search and verbal communication with nearby Public Water Providers showed the District that meter accuracies decrease with age [3]. We found that an average factor for the decrease is at least 0.67% loss in accuracy per year. A District study of metering accuracy over a cross section of its own meters in March 2001 confirmed the drop off in accuracy with time. The District has over 4200 residential water meters over 15 years old, representing more than 47% of the District's Single Family accounts. This group of meters is losing at least 10% of the water that passes through the meters, with the resultant loss of revenue. To mitigate this loss, the District implemented the District-wide Residential Meter Replacement project which will replace all the residential meters 15 years or older in the next 36 months with new meters of the

[3] for example, see Yee, M. D., *Economic Analysis for Replacing Residential Meters,* AWWA Journal, Volume 91, Issue 7

same size. The proposed grant would allow the District to accelerate this project. Thereafter, the meters will be replaced in the year the meter reaches 15 years. The residential accounts are low volume accounts; usually with 5/8" meters that cost between $58 and $70 to replace. These low volumes per account and low costs per unit indicated to the District that a detailed study of individual meters was not cost effective. Consequently, the decision was made to replace all residential meters at the 15 year mark. Through January 2002, 449 residential meters have been replaced. The remainder will be replaced within the following months using the District's personnel.

The capital cost of the Residential Meter Replacement program is:

4230 meters x ($65 material + $31 labor) + $28,000 analysis = $433,000.

The expected benefit due to the increased accuracy of the new meters is expected to be:

New Reading = Current reading/90% accuracy = 111.1% x Current reading.

The District estimates that the Residential Meter Replacement program will increase accounted water by 140 AF/yr. with a resultant increase in revenue of $105,200 per year. Please note that this is water that is not actually lost. In the terminology of the AWWA study it is an Apparent or "Paper" loss. The water is used by the customer but currently is not recorded in the District's billing.

The District has the age data for the meters readily available in its computer system. Two water technicians are now on staff to replace the 4230 5/8" meters in this project. The District's current timeline is to replace the meters within three years. While this timeline is feasible, the proposed grant would allow the District to add staff to complete the project in half the time.

Commercial Meters The District has substantially fewer Commercial meters than residential meters in its service area. Only about 660 DSRSD meters are 1" in diameter or larger. However, the larger meters carry a substantially larger volume of water than the 5/8" meters. Any metering inaccuracies would result in a larger revenue loss. Also, in the literature search and in conferring with other nearby Water Service Providers, the District found that the loss in a utility's larger meters is historically even more severe than in the single family residential ones [4]. Reviewing the types of meters used by the District, we found that the 195 1" meters were displacement types and nearly all the 465 meters larger than 1" in diameter were of the turbine type rather than a displacement type of meter. Turbine meters are much more susceptible to inaccuracies from being installed in an installation that does not meet the manufacturer's specifications.

In January 2002, DSRSD began a Commercial Meter Survey of the 660 meters 1" or larger. Preliminary indications are that more than 90% of the District's turbine meters are installed with severe deviations from manufacturers'

[4] for example, Personal communication: *Contra Costa Water District ,Commercial Meters Testing and Replacement*, Mike Holly, Jan. 2002

specifications (doglegs, appurtenances in the line upstream of the meter, etc.) [5] These meters will seriously under-read the actual throughput due to turbulent rather than laminar flow through the meter at higher flow rates. In addition, the same preliminary indications show that nearly half of the turbine meters record a bi-monthly usage so low that much of the usage is below the manufacturer's minimum flow rate for 95% accuracy.

The survey now underway will pinpoint the installations where the deficiencies in the layout itself will cause inaccuracies in the meter readings and how severe those deficiencies are. A simultaneous review of the water consumption history will point out those accounts where the water consumption is outside the upper or lower flow limits for meter accuracy as specified by the manufacturer. The Commercial Meter Survey project will combine these two factors and produce a prioritized list of accounts requiring revision of the installation and/or replacement of the meter with a different type or replacement with a different size. The District estimates that correcting the deficient turbine meter installations and "right-sizing" the larger meters will result in accounting for an additional 367 AF/yr., equivalent to $277,000 recorded by the billing department. Interestingly, in the first week of the commercial meter survey, two out of thirty meter installations were found to have a significant leak between the angle meter stop and the meter itself. Repairing leaks of this kind which are found during the survey will result in additional reductions in Real Losses.

Three Year Project of Leak Detection and Repair To address the 7.6% of total supply (563 AF/yr.) lost through unknown leaks in the distribution system, the District has embarked on a program designed to focus on individual pressure zones in the service area. Recording meters will be installed at individual pump stations throughout the district to record the water passing into each zone. Please see Figure 1 for a map of the pressure zones.

After the meters are operating, the District intends to use a Datalogger Analysis consultant to analyze the flow through the pumps and meters throughout the day, but particularly late at night in non-irrigation periods[6]. The datalogger will indicate the volume leaving the distribution system when theoretically nearly all the homes and businesses have no real water consumption. The info will thus indicate the severity of the water leaks in the individual pressure zones. The second part of he the leak detection cycle will be the use of a Leak Detection Correlator and consultant to locate and identify the leaks in the zone adding up to the volume estimated by the datalogger.

The estimated cost for the equipment and the analysis of this program is expected to be $630,000 spread over three years. Of this amount, the zone meters and analysis is expected to total $330,000 and the repair work is anticipated to cost $300,000. Eliminating the leakage of 563 AF/yr. identified in the 2001 Water Audit would pay out in slightly over two years.

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[5] for example, Sensus Technologies, Inc, *Water Measurement Equipment and Systems catalog*

[6] for an example of Datalogger utility, see: Lessick, D., *Using Dataloggers to Find Leaks and Other Water Waste* AWWA - 2002 Water Sources Conference Proceedings

2. Task List and Schedule Please see attached Task Schedule

3. Monitoring and Assessment The Dublin San Ramon Services District has already established the baseline against which to measure the progress of improving the District's Water Use Efficiency. This was the Water Audit of 2001[7]. The District will conduct another Water Audit following the completion of the three projects making up the Water Lost Recovery Program. That water audit will generate figures for Lost Water volumes and percentages to compare to the original audit. The success of the program will be measured by how close to the District target of no more than 4% of total supply the new audit shows Lost Water to be.

For the Residential Meter Replacement project, trackable performance indicators are: number of meters replaced each month; cost of replaced meters and fittings; and system leaks found and repaired in the process of replacing the residential meters. The targets are 4230 meters and an average of $65 total tangible cost per installation.

The technicians also keep a daily log of the meters replaced which becomes a part of the permanent record of the customer service archives. Sufficient time (most likely one year) must elapse before enough bi-monthly readings are available on individual meters to adequately judge the Residential Meter Replacement project. Since the number of meters to be replaced is so large, a study of the effect on each account is not planned. Instead, when enough data is available, a statistical analysis of the effects on the residential accounts is planned with a suitable control group of nearby meters to provide for changes due to varying climate conditions, etc.

In addition, the District plans to study the effects of the Commercial Meter Survey and Replacement project. Because the number of commercial meters (660) is more manageable, the District plans to document any changes in water consumption for each commercial account based on the changes in meter type, size and alterations of the installation. The overall impact of this project will be the summation of the individual changes. It is understood that error may be introduced into this analysis by other factors besides meter changes (such as water savings due to other conservation measures); but statistical analysis will provide estimates of recovered water volumes.

Monitoring the effects of Three Year Project of Leak Detection and Repair breaks down into monitoring the effects of the work in each of the pressure zones of the District. Trackable factors include: capital cost of the pressure zone meters and fittings; rentals and fees for the datalogging and correlation work; and number and volume of leaks found and repaired.

[7] Brown and Caldwell, *System Water Audit for Dublin San Ramon Services District,* Oct. 2001, 11-20836-001/6

This monitoring will be facilitated by the cyclical nature of the Leak Detection work. Each round of analysis in any pressure zone will serve as the baseline of the round following it for that zone. For the results of the initial datalogging and Leak detection/repair, a comparison to the Actual Water Losses in the 2001 Water Audit will be made.

Each of the three separate projects in the Lost Water Recovery Program should yield a result of high interest to the national community of water providers. This is especially true considering the District's intent to adopt the AWWA's soon-to-be standardized methodology and terminology. The District intends to share the results of each of these projects with the professional community through presentation of technical papers at AWWA conferences.

4. Preliminary Plans and Specifications and Certification Statements

Please see the attached Spreadsheet labeled "Preliminary Plans and Specifications" and the attached Certification Statement.

C. Qualifications of the Applicants and Cooperators

1. Please see the resumes of the project managers attached to the proposal.

2. Role of external cooperators. No external cooperators are planned.

D. Benefits and Costs

1. Budget Breakdown and Justification.

Please see the attached spreadsheet labeled "DSRSD Lost Water Recovery Program Budget"

2. Cost-sharing:

No cost-sharing is anticipated.

3. Benefit Summary and Breakdown:

a. Quantifiable project benefits:

Residential Meter Replacement Project

This project will generate a savings in Apparent Water Loss of 70 AF/yr. in 2002. Thereafter the Apparent Water Loss savings will be 140 AF/yr.

Commercial Meter Survey and Replacement Project

This project will generate a savings in Apparent Water Loss of 183.5 AF/yr. in 2002. Thereafter the Apparent Water Loss savings will be 367 AF/yr.

Three Year Leak Detection and Repair Project

This project will generate a savings in Real Water loss of 281.5 AF/yr. in 2003. Thereafter the Real Water Loss savings will be 563 AF/yr.

b. Qualitative description of project outcomes:

DSRSD expects that its Lost Water Recovery program will contribute in several qualitative ways to Water Use Efficiency within the boundaries of the District, regionally and in the national effort as well.

Within the District, DSRSD expects that the Water Loss Recovery Program will help many of its customers become more aware of the importance of water conservation in making water available to all the water users in the area. The same conservation-minded customer base will become more aware of the importance of accurate monitoring of water use in the area of managing the water resource. Individual customers will work to conserve water due to the twin motivations of personal financial savings and community improvement.

A successful program will also give DSRSD personnel the tools and experience to better analyze the District's water distribution system and plan for future water conservation projects.

On a regional as well as a national basis, a successful program can serve as an example of what a well planned effort can achieve in the way of water savings and revenue gains for medium-sized utilities. The adoption of uniform terminology and methods to address water loss problems across the United States will be advanced by DSRSD's use of that terminology in its technical papers on the results.

4. Assessment of Costs and Benefits:

In developing this program, DSRSD made the following assumptions:

Residential Meter Replacement Project

1. Additional qualified staff could be found to accelerate the installation of the meters.

2. The Meters to be replaced are all 15 years or older. The assumption is that these meters have lost accuracy averaging 0.67% per year.

Commercial Meter Survey and Replacement Project

1. DSRSD will be able to provide a continuous water supply to the customers as the meter installations are upgraded.

2. Sufficient qualified consultant staff can be retained to upgrade meter installations and replace meters as needed.

3. Displacement type (i.e. sealed register) meters will be used for meter sizes 2" and less. Meters larger than 2" will be either compound meters or continue to be turbine type meters where the flow rates require them.

4. Meter accuracy in the turbine meters has been reduced by the installations which do NOT meet manufacturer's specifications; particularly in regard to the provisions to create laminar flow ahead of the meters.

5. Meters which are experiencing flow rates outside the manufacturer's upper and lower limits for accuracy are recording inaccurate flow rates in those flow periods.

Three year Leak Detection and Repair Project

1. The Dataloggers and consultants will be able to identify and quantify leaks based on late-night flow through the pressure zone meters.

2. The Leak Detection Correlators and contractors will be able to pinpoint the location of major leaks in the pressure zones.

d. Compiled Table of Value of Cost and Benefit:

Beneficiary	Cost	Benefit
Quantified:		
Dublin San Ramon Services District	$1.350 Million	$1.592 Million

Unquantified:

Dublin San Ramon Services District	Improved Conservation Awareness
	More trained personnel for future plans
Regional and Federal	Impetus to adopt standard methodology

e. Program and Grant are Locally Cost Effective; i.e. B/C >1.0:

The budgeted costs of the entire DSRSD Lost Water Recovery Program are expected to total $1,350,000 over three years.

The benefits from both the Residential Meter Replacement and Commercial Meter Survey and Replacement projects are expected to become evident as the programs advance. Thus in the second half of 2002, each of these projects will produce half of the annual water savings. The Residential program will save 70 AF and the Commercial project will save 183.5 AF in 2002. For the next two years, full benefit is expected from both projects, 140 AF/yr for the Residential meter project and 367 AF/yr. for the Commercial meter project.

For the Three Year Leak Detection project starting in 2002, approximately one half the annual benefit will be seen in year 2003(281.5 AF) and a full year benefit of 563 AF in 2004.

Thus the total tangible benefit to the District is:

	Residential	Commercial	Three Year
2002	70 AF	183.5 AF	-
2003	140 AF	367 AF	281.5 AF
2004	140 AF	367 AF	563 AF

Total over all three years = 2112 AF

In the District's current rate structure, water is charged at $1.73 per CCF or $753.60 per AF. Thus the value of the water savings over three years is $1,592,000. Over the three year life of the program, the total B/C ratio is:

Benefit / Cost = $1,592,000 / $1,350,000 = 1.18

It is expected that the positive effects of all three projects will continue past the three year time period; particularly for the meter replacement programs where the meters should have a life expectancy of at least 10 years. In this case, the Benefit to Cost ratio will further improve.

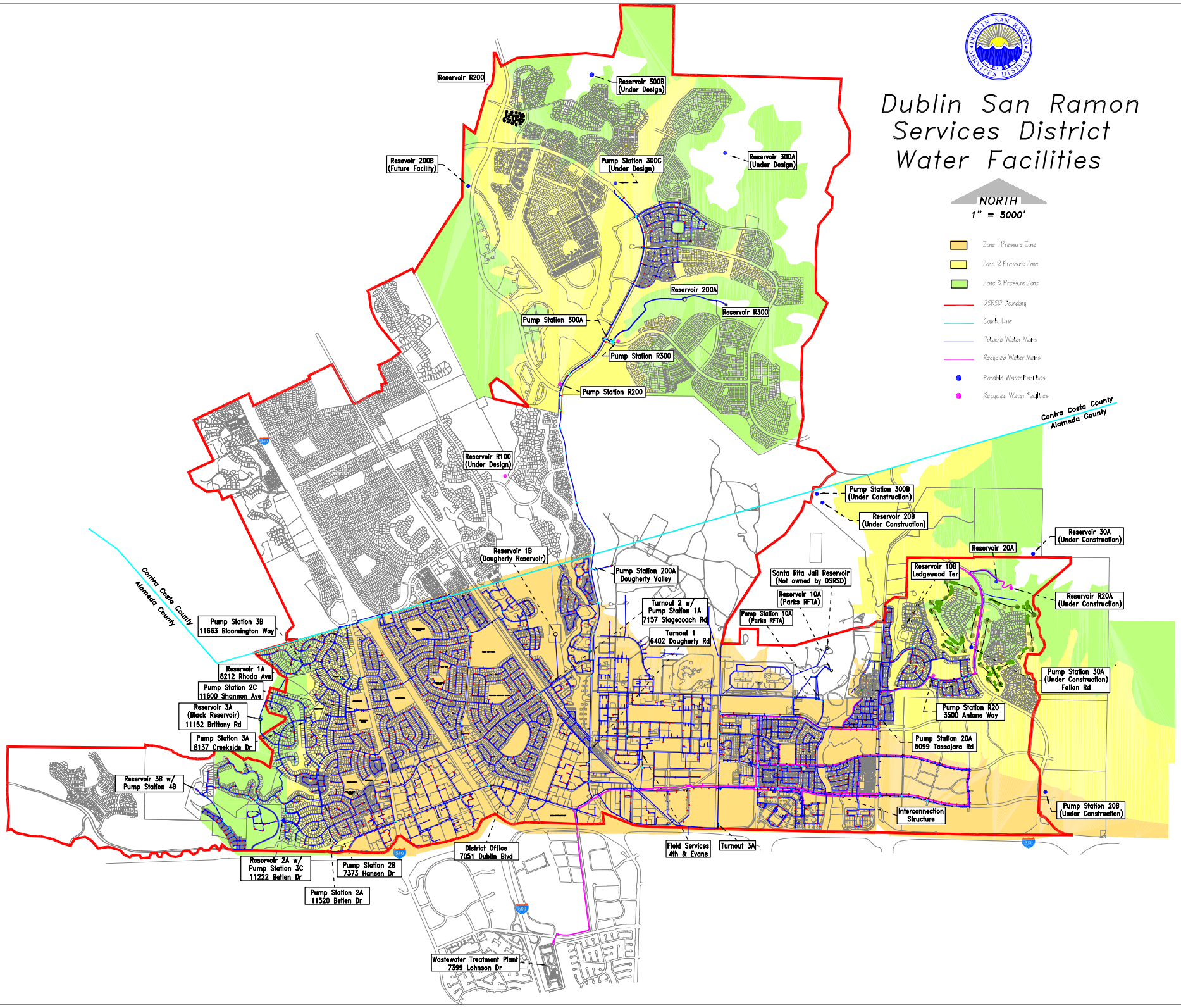
E. Outreach, Community Involvement and Acceptance

DSRSD is fortunate to be situated in an area of environmentally aware and concerned customers and neighbors. Generally, our customers understand the need to conserve and manage our water resource and balance that objective against the regular bi-monthly bills to be paid. Our customers understand that the District must measure the water usage for each account. They agree with the District's rate structure, which has only two rate steps, and does not lower the incremental rate for larger users. The District expects that public acceptance of our program will be excellent since the program is aimed at improving the accuracy of metering.

In addition, this program is one which will generate additional revenue for the District. It will enable the District to continue to provide water at competitive rates in the region. We see this program as one that will "sell itself", i.e. this program is needed to keep water rates low for our customers and will pay for itself in three years.

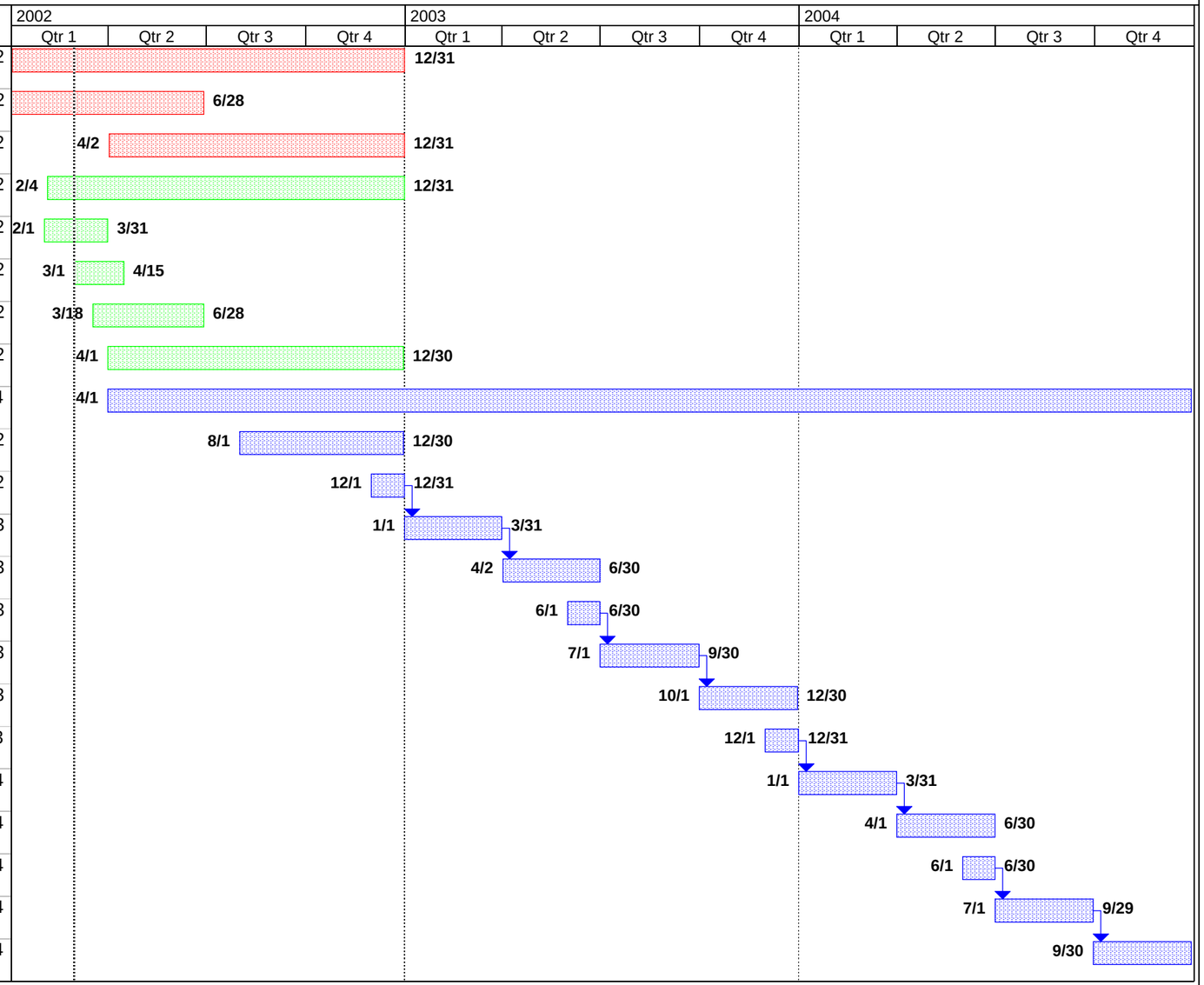
Public outreach in our District for water metering and water service is currently done mainly on a grassroots level. We still maintain a customer service counter where many of our customers come in to pay their water bills. Also, our meter readers are trained to offer advice on water conservation and leak prevention as they make their rounds on foot reading the meters. This face-to-face interaction to our customers is one of the strongest tools the District has to inform and to listen to our customers. The three projects in our overall program will be described to our customers as projects that will first improve the accuracy of the meters and second find leakage for which the District ultimately has to pay in rates and fees. The public response to the District's neighbor-like communication has always been positive.

With funds from the grant two or three local people can be hired to accelerate the Residential Meter Replacement Project.


Dublin San Ramon Services District Water Facilities
NORTH
1" = 5000'
Zone 1 Pressure Zone
Zone 2 Pressure Zone
Zone 3 Pressure Zone
DSRSD Boundary
County Line
Potable Water Mains
Recycled Water Mains
Potable Water Facilities
Recycled Water Facilities
Reservoir R200
Reservoir 300B (Under Design)
Resevoir 200B (Future Facility)
Pump Station 300C (Under Design)
Reservoir 300A (Under Design)
Reservoir 200A
Reservoir R300
Pump Station 300A
Pump Station R300
Pump Station R200
Contra Costa County
Alameda County
Reservoir R100 (Under Design)
Pump Station 300B (Under Construction)
Reservoir 20B (Under Construction)
Reservoir 30A (Under Construction)
Reservoir 20A
Reservoir 1B (Dougherty Reservoir)
Pump Station 200A Dougherty Valley
Santa Rita Jail Reservoir (Not owned by DSRSD)
Reservoir 10B Ledgewood Ter
Reservoir 10A (Parks RFTA)
Reservoir R20A (Under Construction)
Pump Station 10A (Parks RFTA)
Turnout 2 w/ Pump Station 1A 7157 Stagecoach Rd
Turnout 1 6402 Dougherty Rd
Pump Station 3B 11663 Bloomington Way
Reservoir 1A 8212 Rhoda Ave
Pump Station 2C 11600 Shannon Ave
Reservoir 3A (Black Reservoir) 11152 Brittany Rd
Pump Station 3A 8137 Creekside Dr
Pump Station 30A (Under Construction) Fallon Rd
Pump Station R20 3500 Antone Way
Pump Station 20A 5099 Tassajara Rd
Reservoir 3B w/ Pump Station 4B
Interconnection Structure
Pump Station 20B (Under Construction)
District Office 7051 Dublin Blvd
Field Services 4th & Evans
Turnout 3A
Reservoir 2A w/ Pump Station 3C 11222 Betlen Dr
Pump Station 2B 7373 Hansen Dr
Pump Station 2A 11520 Betlen Dr
Wastewater Treatment Plant 7399 Lohnson Dr

DSRSD Lost Water Recovery Program

ID	Task Name	Duration	Start	Finish
1	RESIDENTIAL METER REPLACEMENT PROJECT	261 days	Wed 1/2/02	Tue 12/31/02
2	Replace 4230 5/8" residential meters more than 15 years old with new meters	129 days	Tue 1/1/02	Fri 6/28/02
3	Engn Monitoring of New Meters; Quantify "Recovered Water Losses"	197 days	Tue 4/2/02	Tue 12/31/02
4	COMMERCIAL METER SURVEY & REPLACEMENT PROJECT	238 days	Mon 2/4/02	Tue 12/31/02
5	Review of 660 Commercial Meters Installations & Flow Rates for Accuracy	41 days	Fri 2/1/02	Sun 3/31/02
6	Selection of New Type or Redesign of Meter Installations as Needed	32 days	Fri 3/1/02	Mon 4/15/02
7	Install New Meters & Improve Installations as Needed	75 days	Mon 3/18/02	Fri 6/28/02
8	Engn Monitoring of New Meters & Installations; Quantify "Recovered Water Losses"	197 days	Mon 4/1/02	Mon 12/30/02
9	THREE YEAR LEAK DETECTION AND REPAIR PROJECT	720 days	Mon 4/1/02	Wed 12/29/04
10	Installation of new Zone Meters	109 days	Thu 8/1/02	Mon 12/30/02
11	DataLogger of Zone 1 - Identify Suspected Leak Volumes	23 days	Sun 12/1/02	Tue 12/31/02
12	Correlating Noise Logging of Zone 1 - Pinpoint Suspected Leak Locations	64 days	Wed 1/1/03	Mon 3/31/03
13	Repair of Identified Leaks in Zone 1	65 days	Wed 4/2/03	Mon 6/30/03
14	DataLogger of Zone 2 - Identify Suspected Leak Volumes	22 days	Sun 6/1/03	Mon 6/30/03
15	Correlating Noise Logging of Zone 2 - Pinpoint Suspected Leak Locations	66 days	Tue 7/1/03	Tue 9/30/03
16	Repair of Identified Leaks in Zone 2	65 days	Wed 10/1/03	Tue 12/30/03
17	DataLogger of Zone 3 - Identify Suspected Leak Volumes	23 days	Mon 12/1/03	Wed 12/31/03
18	Correlating Noise Logging of Zone 3 - Pinpoint Suspected Leak Locations	65 days	Thu 1/1/04	Wed 3/31/04
19	Repair of Identified Leaks in Zone 3	65 days	Thu 4/1/04	Wed 6/30/04
20	DataLogger of Dougherty Valley Zones - Identify Suspected Leak Volumes	22 days	Tue 6/1/04	Wed 6/30/04
21	Correlating Noise Logging of Dougherty Valley Zones - Pinpoint Suspected Leak Locations	65 days	Thu 7/1/04	Wed 9/29/04
22	Repair of Identified Leaks in Dougherty Valley Zones	65 days	Thu 9/30/04	Wed 12/29/04



Project: Correct Water Shortage & Ac
Date: Thu 2/28/02

Task	Summary	Rolled Up Progress	Project Summary
Progress	Rolled Up Task	Split	External Milestone
Milestone	Rolled Up Milestone	External Tasks	Deadline

Inseparable tasks are grouped by color

Thu 2/28/02

B. Scope of Work: Technical/Scientific Merit, Feasibility, Monitoring and Assessment

Part 4. Preliminary Plans and Specifications

Residential Meter Replacement Project

Material	Number	Size	Type	Location
Residential Meter	7230	5/8"	Sealed Register	Various locations in service area
various fittings for above	3500 est.	5/8"	PVC	as needed
Meter boxes	75 est. 1% broken			as needed

Commercial Meter Survey and Replacement Project

Material	Number	Size	Type	Location
6" Water Meter (1 in service area)	0	6"	Turbine	Various locations in service area
Retain Turbine type, change installation				
various fittings for above	1	6"	PVC	as needed
4" Water Meter (3 in service area)	0	4"	Turbine	Various locations in service area
Retain Turbine type, change installation				
various fittings for above	3	4"	PVC	as needed
3" Water Meter (38 in service area)	0	3"	Turbine	Various locations in service area
Retain Turbine type, change installation				
various fittings for above	38	3"	PVC	as needed
2" Water Meter (191 in service area)	191	2"	Sealed Register	Various locations in service area
Change Turbine type to Sealed Register, retain installation				
various fittings for above - 10% leaks	20	2"	PVC	as needed
1 1/2" Water Meter (191 in service area)	236	1 1/2"	Sealed Register	Various locations in service area
Change Turbine type to Sealed Register, retain installation				
various fittings for above - 10% leaks	25	1 1/2"	PVC	as needed
1" Water Meter (195 in service area)	0	1"	Sealed Register	Various locations in service area
Retain current Sealed Register type, retain installation				
various fittings for above - 10% leaks	20	1"	PVC	as needed

Three Year Leak Detection and Repair Project

Material	Number	Size	Type	Location
Pressure Zone 1				
Turn Out #1 Meter	1	12"	Turbine	Turn Out #1
Turn Out #2 Meter	1	12"	Turbine	Turn Out #2/Pump Station 1A
Turn Out #3 Meter	1	12"	Turbine	Turn Out #3
various fittings for above meters		12"	PVC	
Pressure Zone 2				
Pump Station 2A Meter	1	8"	Turbine	Pump Station 2A
Pump Station 2B Meter	1	10"	Turbine	Pump Station 2B
Pump Station 2C Meter	1	8"	Turbine	Pump Station 2C
various fittings for above meters		8-10"	PVC	
Pressure Zone 3				
Pump Station 3A Meter	1	8"	Turbine	Pump Station 3A
Pump Station 3B Meter	1	8"	Turbine	Pump Station 3B
Pump Station 3C Meter	1	8"	Turbine	Pump Station 3C
Pump Station "4B" Meter	1	4"	Turbine	Pump Station "4B"
various fittings for above meters		4-8"	PVC	

Dublin San Ramon Services District
Lost Water Program Project Manager

David K. Behrens, P.E.

PROFESSIONAL EXPERIENCE

Dublin San Ramon Services District **August 2001 to Present**
Dublin, California

PRINCIPAL ENGINEER: Responsibilities include overseeing the planning, administration, design, construction, implementation and monitoring of the District's $38M annual Capital Improvement Program. Typical projects are associated with water supply and wastewater collection improvements including treatment facilities, transmission and distribution pipelines, pump stations, and storage facilities.

Marin Municipal Water District **April 1993 to July 2001**
Corte Madera, California

PRINCIPAL ENGINEER: Responsibilities included overseeing the engineering design services, engineering operation and support services, and construction management services groups, and overseeing the planning, administration, implementation and monitoring of the District's $20M annual Capital Improvement Program, $77M (15-year) Fire Flow and Seismic Reliability system upgrades, and $38M (6-year) Measure W Bond Projects. Typical projects were associated with water supply improvements including treatment facilities, transmission and distribution pipelines, pump stations, storage facilities, roadway rehabilitation and site drainage facilities, building construction and maintenance, new development facilities.

Kleinfelder, Inc. **March 1991 to March 1993**
Walnut Creek, California

SENIOR PROGRAM MANAGER: Responsibilities included the overseeing the administration, implementation and monitoring of the budgeting, planning, design, contract administration and construction management for a variety of public and private works projects including civil design projects, soil and ground water remediation, wastewater and water resource projects.

DB Flett & Associates **December 1986 to March 1991**
Walnut Creek, California

FIRM ASSOCIATE: Performed planning, design, surveying and construction management for a variety of civil, sanitary and environmental projects including water and wastewater facilities, flood control facilities, street and roadway design, and residential and commercial developments.

Contra Costa Water District **November 1981 to December 1986**
Concord, California

SENIOR ENGINEER: Senior Engineer and Construction Manager for Contra Costa Water District in Concord, California. My responsibilities included managing a staff consisting of engineers, supervisors, construction inspectors, draftspersons, corrosion control technicians and clerical support. As supervisor of the Design and Construction Group, Corrosion Group, Record and Mapping Group and New Business Development Group my responsibilities included the planning, design, contract administration and construction management for the District's annual capital improvement program.

Clendennen & Associates **September 1980 to November 1981**
Auburn, California

ASSOCIATE ENGINEER: Performed the planning, design, contract administration and construction management for a variety of civil, sanitary and environmental projects including water and wastewater facilities, flood control facilities, street and roadway design, and residential and commercial developments.

San Jose Water Company **April 1978 to September 1980**
San Jose, California

ASSISTANT ENGINEER: Performed the planning, design, contract administration and construction management for a variety of water distribution facilities.

Education

San Jose State University: MASTER OF SCIENCE IN CIVIL ENGINEERING

San Jose State University: BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Professional Licenses

State Board of Registration for Professional Engineers & Land Surveyors
Professional Registration No. C 32807

Dublin San Ramon Services District
Lost Water Recovery Project

Certification Statement

The Preliminary Plans and Specifications for the Lost Water Recovery Program were prepared under my supervision. This program is feasible under current conditions.

Name: David K. Behrens _____

Date: _____

DSRSD LOST WATER RECOVERY PROGRAM BUDGET

(Completed in MS Excel for Windows.)

1) Costs are listed by individual projects within the overall program.

Residential Meter Replacement Project													
	2002, qtr. 1	*2002, qtr. 2*	*2002, qtr. 3*	*2002, qtr. 4*	*2003, qtr. 1*	*2003, qtr. 2*	*2003, qtr. 3*	*2003, qtr. 4*	*2004, qtr. 1*	*2004, qtr. 2*	*2004, qtr. 3*	*2004, qtr. 4*	
Land Purchase & Easement													
Planning/Design & Engineering													
Materials & Installation													
4230 5/8" meters	42,500	42,500	42,500	42,500	42,500	42,500							255,000
Misc fittings	3,500	3,500	3,500	3,500	3,500	3,500							21,000
Labor	21,500	21,500	21,500	21,500	21,500	21,500							129,000
Structures													
Equipment Purchases & Rentals													
Environmental Mitigation & Enhancement													
Construction, Administration & Overhead													
Engr Monitoring of Usage in new meters		4,000	4,000	4,000	4,000	4,000	4,000	4,000					28,000
Project Legal & License Fees													
Contingency, 10%													
Other													
Project Subtotals	**67,500**	**71,500**	**71,500**	**71,500**	**71,500**	**71,500**	**4,000**	**4,000**	**0**	**0**	**0**	**0**	**433,000**

Commercial Meter Survey and Replacement Project

	2002, qtr. 1	*2002, qtr. 2*	*2002, qtr. 3*	*2002, qtr. 4*	*2003, qtr. 1*	*2003, qtr. 2*	*2003, qtr. 3*	*2003, qtr. 4*	*2004, qtr. 1*	*2004, qtr. 2*	*2004, qtr. 3*	*2004, qtr. 4*	
Land Purchase & Easement													
Planning/Design & Engineering													
Analysis of Installation & Usage vs Accuracy Limit	65,000												65,000
Materials & Installation													
New meters - 1.5" to 4"	50,000	50,000											100,000
Misc fittings	15,000	15,000											30,000
Install Labor	15,000	35,000											50,000
Leak Repair Labor	20,000	10,000											30,000
Structures													
Equipment Purchases & Rentals													
Environmental Mitigation & Enhancement													
Construction, Administration & Overhead													
Engr Monitoring of Usage in new meters		4,000	4,000	4,000									12,000
Project Legal & License Fees													
Contingency, 10%													
Other													
Project Subtotals	**165,000**	**114,000**	**4,000**	**4,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**287,000**

Three Year Leak Detection and Repair Project

	2002, qtr. 1	*2002, qtr. 2*	*2002, qtr. 3*	*2002, qtr. 4*	*2003, qtr. 1*	*2003, qtr. 2*	*2003, qtr. 3*	*2003, qtr. 4*	*2004, qtr. 1*	*2004, qtr. 2*	*2004, qtr. 3*	*2004, qtr. 4*	
Land Purchase & Easement													
Planning/Design & Engineering													
Zone Meters at Zone Valves and Pumps Stns		45,000	30,000										75,000
Materials & Installation													
New meters			90,000	75,000									165,000
Misc fittings			20,000	15,000									35,000
Install Labor			30,000	25,000									55,000
Structures													
Equipment Purchases & Rentals													
DataLogger Rental and Analysis				20,000		15,000		15,000		15,000			65,000
Corelator Leak Detector Rental and Analysis					25,000		25,000		25,000		25,000		100,000
Environmental Mitigation & Enhancement													
Construction, Administration & Overhead													
Engr Monitoring of Corelator Data & Usage					7,000		5,000		4,000		4,000		20,000
Repair of Identified Leaks in Water System						35,000		30,000		25,000		25,000	115,000
Project Legal & License Fees													
Contingency, 10%													
Other													
Project Subtotals	**0**	**45,000**	**170,000**	**135,000**	**32,000**	**50,000**	**30,000**	**45,000**	**29,000**	**40,000**	**29,000**	**25,000**	**630,000**
Program Totals	**232,500**	**230,500**	**245,500**	**210,500**	**103,500**	**121,500**	**34,000**	**49,000**	**29,000**	**40,000**	**29,000**	**25,000**	**1,350,000**